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FLOOD INSURANCE STUDY

TOWN OF NORTH CASTLE, NEW YORK
WESTCHESTER COUNTY

REVISED:
JANUARY 2, 1991

Federal Emergency Management Agency

COMMUNITY NUMBER - 360923

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: December 2, 1983

Flood Insurance Study Revised: January 2, 1991

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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the Town of North Castle, Westchester County, New York. This information will be used by the Town of North Castle to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses in this study represent a revision of the original analyses, prepared for the Federal Emergency Management Agency (FEMA). The hydrologic and hydraulic analyses in this revision were prepared by Edwards and Kelcey Engineers, Inc. for FEMA, under Contract No. EMW-85-C-1887. This work was completed in June 1988.

1.3 Coordination

On September 19, 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the town, and Edwards and Kelcey Engineers, Inc. (the study contractor) to determine the streams to be studied by detailed methods. During the course of the study, a search for basic data was made at all levels of government. The U. S. Geological Survey (USGS) was contacted and provided information on USGS water-surface discharge data. The intermediate CCO meeting was held on May 6, 1988 with representatives of the town to obtain additional local input.

On February 5, 1990, a final CCO meeting was held with representatives of FEMA, the town, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of North Castle, Westchester County, New York. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: Bear Gutter Creek, from Kensico Reservoir to a point approximately 0.4 mile upstream of State Route 22; the Byram River, from the downstream corporate limits to Byram Lake Reservoir; the Wampus River, from its confluence with the Byram River to Wampus Pond; Tributary 1 to the Wampus River, from its confluence with the Wampus River to a point approximately 0.3 mile upstream of Orchard Drive; Tributary 2 to the Wampus River, from its confluence with the Wampus River to a point approximately 0.7 mile upstream of Faraway Road; and Tributary 3 to the Wampus River, from its confluence with the Wampus River to a point approximately 0.4 mile upstream of Wayne Valley Road. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through June 1993.

The following flooding sources were studied by approximate methods: Tributary to Byram River, the Mianus River, the Bronx River, Byram Lake Reservoir, Kensico Reservoir, Mianus Reservoir, Kensico Lake, Rye Lake, North Lake, the Lake in the Ledges, Converse Lake, Wampus Pond, Long Pond, Cobamong Pond, Pleasantville Cove, Bear Gutter inlet, Dark Hollow, Webers Cove, Louden Cove, the remaining portions of Bear Gutter Creek and Tributaries 1, 2, and 3 to the Wampus River, and several unnamed tributaries. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Town of North Castle.

2.2 Community Description

The Town of North Castle is located in western Westchester County, approximately 30 miles northeast of New York City. The total land area of the town is approximately 26.3 square miles. It is bordered by the Towns of Bedford and New Castle to the north; the Town of Pound Ridge to the east; the Towns of Greenwich and Stanford, Connecticut, and the Town of Harrison to the south; and the Town of Mount Pleasant to the west. The population of the town was 9,467 in 1980, a decrease of 124 from the 1970 population of 9,591 and an increase of 2,670 over the 1960 population of 6,797 (Reference 1).

Approximately 26 percent of the land in the town is devoted to residential use; three percent is used commercially, industrially, or for manufacturing; 10 percent is devoted to communication, transportation, utilities, and/or public assembly; and the remaining percentage is either vacant and/or open area (Reference 2). The majority of the development has occurred in the Village of Armonk,

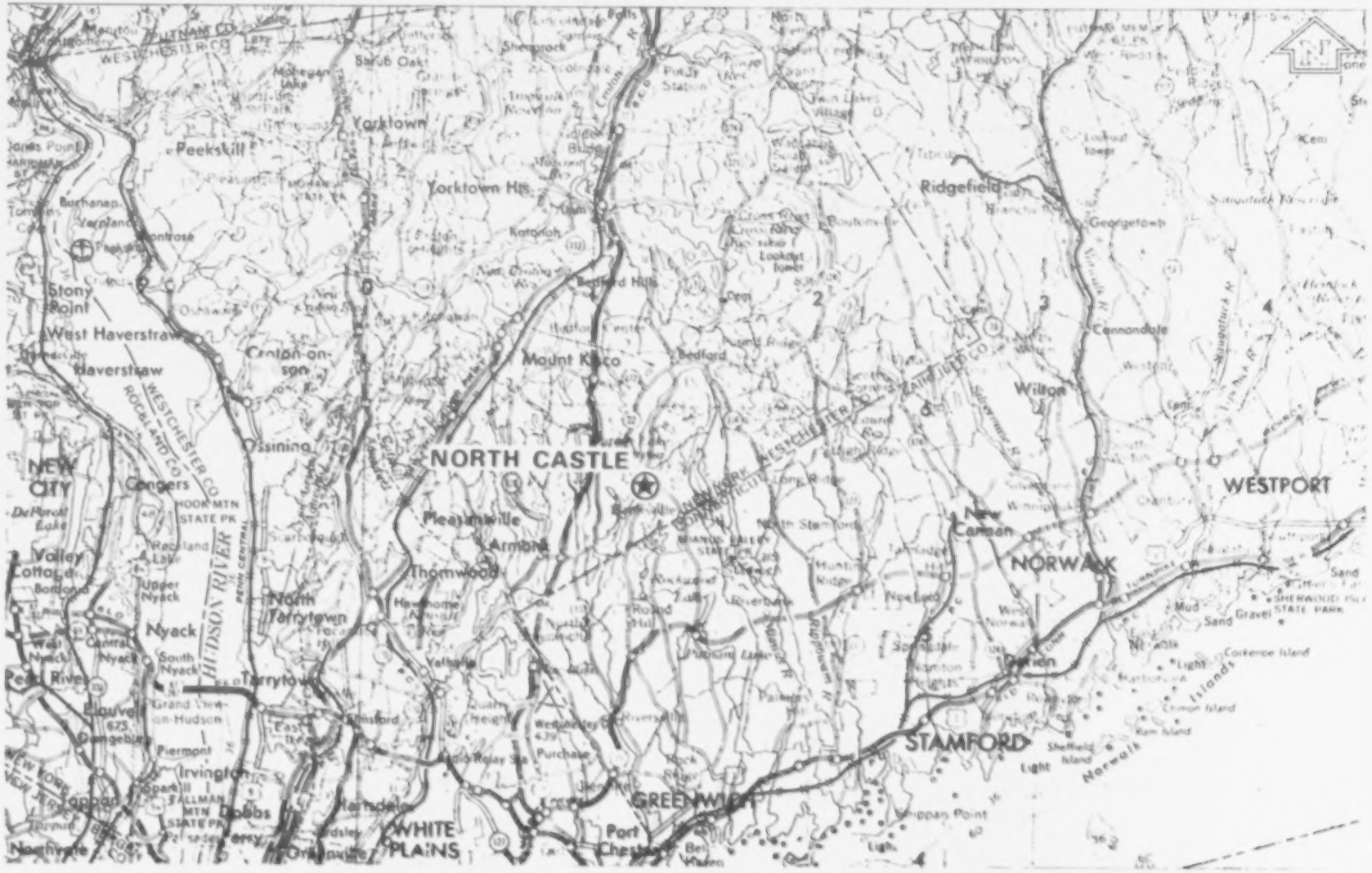


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY

(WESTCHESTER CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

located approximately 0.4 mile east of the intersection of Interstate Route 684 and State Route 22. Within the floodplains, development consists primarily of single-family residences, with a limited amount of commercial development.

Bear Gutter Creek originates approximately 0.6 mile west-northwest of the Village of Armonk and flows towards the southwest to its mouth at Bear Gutter Inlet to Kensico Reservoir. Its drainage area at the mouth encompasses approximately 0.95 square miles.

The Byram River originates approximately 1 mile north of the corporate limits of the Town of North Castle, in the Town of New Castle, and flows towards the southwest through the town. Its drainage area at the downstream corporate limits encompasses approximately 8.39 square miles, including the drainage area for the Byram Lake Reservoir, which creates a water supply for the Village of Mount Kisco.

The Wampus River originates in the Town of New Castle, approximately 0.4 mile northwest of the northern corporate limits of the town, in the vicinity of the Wampus Lake Reservoir. The river flows towards the east, to the confluence of Tributary 2 to the Wampus River, where it turns and flows towards the south to its confluence with the Byram River. Its drainage area encompasses approximately 3.6 square miles at its confluence with the Byram River.

Tributary 1 to the Wampus River originates approximately 1.7 miles northwest of Armonk, and flows towards the southeast, to its confluence with the Wampus River. Its drainage area encompasses approximately 0.7 square miles at its confluence with the Wampus River, approximately 200 feet south of U. S. Route 22.

Tributary 2 to the Wampus River originates approximately 0.1 mile south of the northern corporate limits, in the vicinity of Seven Springs Farm. The tributary flows towards the south, through the town, to its confluence with the Wampus River; at this point the drainage area encompasses approximately 0.8 square miles.

Tributary 3 to the Wampus River originates approximately 0.2 mile north of the northern corporate limits, in the vicinity of Tripp Road. The tributary flows towards the southeast, to its confluence with the Wampus River. Its drainage area is approximately 0.3 square miles at its confluence with the Wampus River.

The tributary to the Pleasantville Cove section of Kensico Reservoir, which flows towards the south, originates within the town. The tributary to Bear Gutter Creek, which flows towards the south, originates within the town. It has a total drainage area of approximately 0.12 square miles at its mouth. The Northwest Tributary to Mianus River, which flows towards the southeast, originates within the town. It has a total drainage area of approximately 0.53 square miles at its mouth. The Southeast Tributary to Mianus River, which flows towards the north, originates

within the town. It has a total drainage area of approximately 0.13 square miles at its mouth. The Tributary to Converse Lake, which flows towards the south, originates within the town. It has a total drainage area of approximately 0.36 square miles at its mouth. Piping Brook, which flows towards the south, originates within the town. It has a total drainage area of approximately 1.18 square miles at the downstream corporate limits.

The climate of the town is characteristically humid-continental. Summer and winter temperatures range from 74.7 degrees Fahrenheit (^{o}F) to 26.2^{o}F, respectively. The average annual precipitation in the region is 38 inches, with a recorded average annual snowfall of 42.4 inches. The precipitation is fairly evenly distributed throughout the year (Reference 3).

2.3 Principal Flood Problems

Research yielded no significant flood history for the Town of North Castle.

2.4 Flood Protection Measures

No flood protection structures currently exist or are planned along any of the streams studied by detailed methods within the town. Nonstructural methods of flood protection are currently used to aid in the prevention of future flooding. The community adheres to and implements the minimum standards for floodplain management as outlined in the NFIP regulations.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The flood-frequency discharge values for the streams studied by detailed methods were determined using a procedure presented in Soil Conservation Service (SCS) Technical Release No. 55 (Reference 4). This procedure relates basin characteristics such as drainage area, 24-hour rainfall, rainfall distribution, soil cover, time of concentration, and travel time to develop peak discharges. The peak discharges for specific recurrence intervals were developed by either a graphical or tabular method based upon drainage basin subarea size.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BEAR GUTTER CREEK					
At mouth	0.95	124	339	460	+
BYRAM RIVER					
At downstream corporate limits	8.39	1,171	2,164	2,576	+
Upstream of confluence of the Wampus River	4.59	436	796	996*	+
Upstream of U. S. Route 22	4.10	400	745	927*	+
Approximately 900 feet downstream of Tributary 1 to Byram River	3.73	376	708	886*	+
Upstream of confluence of Tributary 1 to Byram River	2.87	281	521	656	+
Upstream of Byram Lake Road	0.28	114	224	289	+
WAMPUS RIVER					
At mouth	3.64	692	1,285	1,459	+
Upstream of confluence of Tributary 1 to the Wampus River	2.62	441	804	1,012**	+
Upstream of confluence of Tributary 2 to the Wampus River	1.26	370	690	869	+

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
WAMPUS RIVER (continued)					
Upstream of confluence of Tributary 3 to the Wampus River	0.80	104	199	264	+
TRIBUTARY 1 TO THE WAMPUS RIVER					
At mouth	0.70	162	319	390*	+
TRIBUTARY 2 TO THE WAMPUS RIVER					
At mouth	0.76	166	321	387	+
Approximately 5,073 feet upstream of confluence with the Wampus River	0.33	118	235	316	+
TRIBUTARY 3 TO THE WAMPUS RIVER					
At mouth	0.33	81	145	194	+

*Some sections in this reach have discharges less than computed peak discharges due to existing split flow conditions

**Some sections in this reach have discharges greater than computed peak discharges due to split flow conditions occurring on other streams in the vicinity

+Data not computed

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the backwater analyses of the streams studied by detailed methods were obtained from aerial photographs (Reference 5). The below-water sections were obtained by field measurement. All bridges, culverts, and dams were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer

program (Reference 6). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations were calculated using the slope/area method.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. The following tabulation shows the ranges of channel and overbank "n" values for the streams studied by detailed methods.

Stream	Channel "n"	Overbank "n"
Bear Gutter Creek	0.030-0.060	0.040-0.090
Byram River	0.015-0.070	0.015-0.090
Wampus River	0.015-0.060	0.040-0.100
Tributary 1 to the Wampus River	0.015-0.080	0.030-0.100
Tributary 2 to the Wampus River	0.015-0.050	0.070
Tributary 3 to the Wampus River	0.015-0.040	0.050

Limits of flooding for the flooding sources studied by approximate methods were determined using a USGS Open-File Report (Reference 7). This method used flood height-drainage area curves based on 100-year discharges developed for major watersheds throughout the region. The elevation of the 100-year flood for the streams studied by approximate methods was determined from the appropriate curve using the streams' drainage areas.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries and 100-year floodway to assist in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as

the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 8).

For the streams studied by approximate methods, the boundaries of the 100-year floodplain were delineated using the previously-printed Flood Insurance Study for the Town of North Castle and topographic maps (References 9 and 10).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tributary 1 to Wampus River								
A	1,000	91	179	2.2	376.8	376.8	377.4	0.6
B	2,360	70	100	3.9	382.8	382.8	382.8	0.0
C	3,725	15	41	9.5	414.0	414.0	414.3	0.3
D	4,345	29	54	7.3	435.9	435.9	435.9	0.0
E	5,200	14	40	9.7	465.2	465.2	465.5	0.3
Tributary 2 to Wampus River								
A	432	152	1,035	0.4	390.6	390.6	391.0	0.4
B	1,614	150	831	0.4	390.6	390.6	391.0	0.4
C	5,073	13	34	9.3	408.7	408.7	409.1	0.4
D	6,385	30	45	7.C	478.7	478.7	478.7	0.0
Tributary 3 to Wampus River								
A	1,203	28	32	6.1	431.0	431.0	431.0	0.0
B	2,642	146	878	0.2	473.0	473.0	473.0	0.0
C	3,774	182	946	0.2	473.0	473.0	473.0	0.0

[1]Feet above confluence with the Wampus River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY

(WESTCHESTER CO.)

FLOODWAY DATA

TRIBUTARY 1,2, AND 3 TO WAMPUS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bear Gutter Creek								
A	1,196[1]	26	83	5.5	358.2	354.3[4]	354.3	0.0
B	2,016[1]	26	92	5.0	358.2	358.2	358.3	0.1
C	2,816[1]	38	150	3.1	362.1	362.1	362.4	0.3
D	4,045[1]	60	205	2.2	367.6	367.6	367.9	0.3
Byram River								
A	1,851[2]	280	1,729	1.5	370.0	370.0	370.5	0.5
B	4,498[2]	130	489	1.7	370.7	370.7	371.4	0.7
C	6,358[2]	80	217	3.9	372.2	372.2	372.5	0.3
D	8,130[2]	143	541	1.4	378.8	378.8	378.9	0.1
E	8,840[2]	80	427	2.1	379.0	379.0	379.2	0.2
F	10,706[2]	81	409	2.2	382.4	382.4	382.7	0.3
G	13,390[2]	181	234	2.8	384.8	384.8	385.2	0.4
H	16,675[2]	45	199	3.3	398.8	398.8	399.0	0.2
I	18,325[2]	46	106	2.7	407.7	407.7	407.8	0.1
Wampus River								
A	850[3]	200	700	2.1	370.2	369.1[5]	369.4	0.3
B	1,919[3]	270	1,029	1.4	371.0	371.0	371.3	0.3
C	3,496[3]	94	526	2.2	376.1	376.1	376.7	0.6
D	6,210[3]	279	1,291	0.8	376.6	376.6	377.2	0.6
E	8,235[3]	339	945	1.1	378.0	378.0	378.6	0.6
F	9,245[3]	110	566	1.8	385.7	385.7	385.9	0.2
G	10,219[3]	59	187	4.6	402.0	402.0	402.9	0.9
H	12,880[3]	55	51	5.2	424.0	424.0	424.1	0.1
I	13,790[3]	60	120	2.2	429.5	429.5	429.9	0.4

[1]Feet above Kensico Reservoir
[2]Feet above corporate limits
[3]Feet above confluence with the Byram River
[4]Elevation computed without consideration of backwater effects from Kensico Reservoir
[5]Elevation computed without consideration of backwater effects from the Byram River

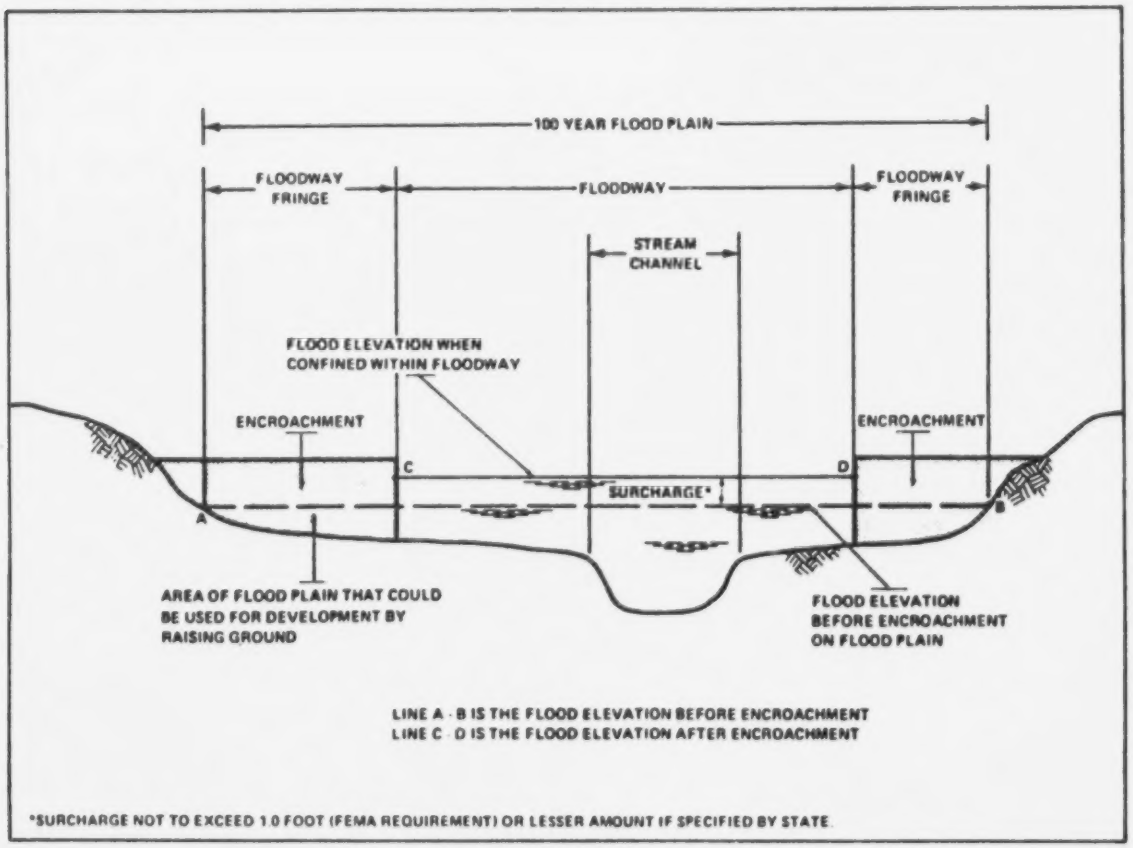
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOODWAY DATA

BEAR GUTTER CREEK-BRYAM RIVER-WAMPUS RIVER

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 2 for certain downstream cross sections of Bear Gutter Creek and the Wampus River are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

Because it is based on more up-to-date analyses, this study supersedes the previously-printed Flood Insurance Study for the Town of North Castle (Reference 9).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, 26 Federal Plaza, Room 1351, New York, New York 10278.

9.0 BIBLIOGRAPHY AND REFERENCES

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6. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, April 1984.

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8. Quinn and Associates, Inc. of Horsham, Pennsylvania, Topographic Maps, Scale 1:4,800, Contour Interval 4 Feet: Town of North Castle, Westchester County, New York.

9. Federal Emergency Management Agency, Flood Insurance Study, Town of North Castle, Westchester County, New York, Washington, D. C., December 2, 1983.

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Ven Te Chow, Open-Channel Hydraulics, New York, McGraw-Hill, 1959.

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City of New York, Department of Environmental Protection, Bureau of Water Supply, Investigation of Dams in East of Hudson District, Contract CRO-166, Main Report.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

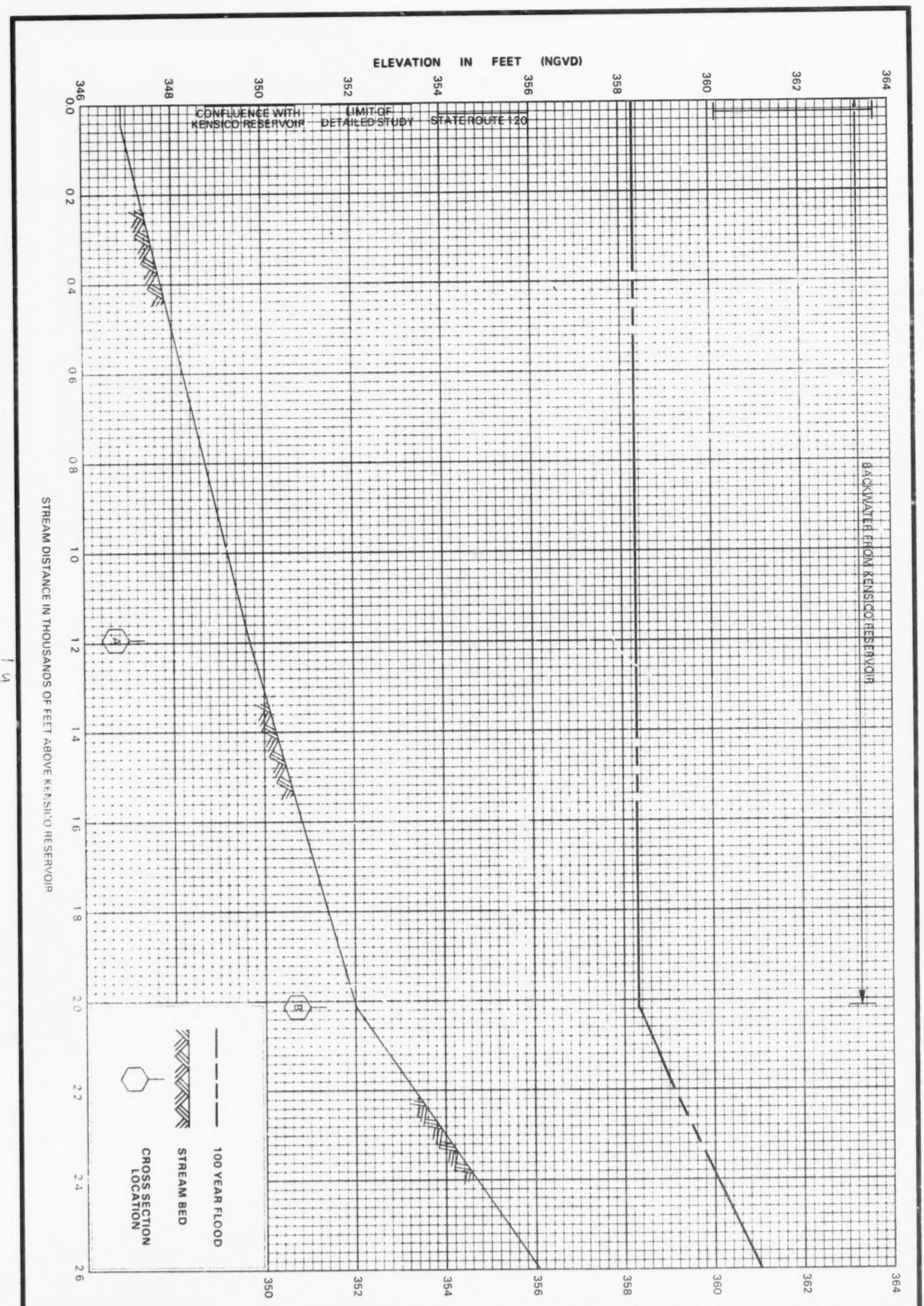
Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	04	366.83	Square cut on top of downstream side of concrete wall of bridge at intersection of State Routes 22 and 120.
RM 2	04	364.54	Downstream right end of headwall of box culvert under State Route 22 for Bear Gutter Creek.
RM 3	04	368.72	Square cut on top of downstream left side of stone headwall for pipe under Kaysal Court Road.
RM 4	04	369.97	Square cut on downstream right abutment wall of bridge on dirt road approximately 1.1 miles south along Interstate Route 684 from State Route 22 intersection and approximately 250 feet west of Interstate Route 684 southbound lanes.
RM 5	04	368.34	Square cut on top of large rock, approximately 0.7 mile south along Interstate Route 684 from State Route 22 intersection and approximately 70 feet west of west edge of Interstate Route 684 southbound lanes.
RM 6	04	376.97	Square cut on downstream left end of headwall of concrete box culvert under State Route 22, approximately 120 feet east from Interstate Route 684 southbound overpass.
RM 7	04	375.42	L cut on downstream right corner of headwall of box culvert under State Route 22 at intersection with Business Park Drive.
RM 8	04	376.95	Square cut on downstream right end of headwall for box culvert for Tributary 1 to the Wampus River under State Route 22.
RM 9	04	373.38	Top of pipe at upstream end of culvert, approximately 500 feet upstream, at State Route 22.

EXHIBIT 3 - ELEVATION REFERENCE MARKS - continued

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 10	04	381.33	Square cut on upstream left end of concrete box culvert under State Route 128 (across from Armonk Texaco Station).
RM 11	08	397.43	Square cut in center of downstream headwall of culvert under Maple Avenue approximately 210 feet south of Annandale Street.
RM 12	08	467.59	Square cut on downstream right end of stone headwall of unnamed road approximately 800 feet north of Maple Avenue.
RM 13	08	375.09	Top of downstream right end wall of School Street crossing.
RM 14	08	441.90	Square cut on upstream left end of headwall of culvert under State Route 128, approximately 30 feet south of State Route 128 centerline and approximately 250 feet east of Wampus Lake Road along State Route 128.
RM 15	08	396.49	Square cut on upstream left end of headwall of culvert under High Street, in vicinity of Greenway Road intersection.
RM 16	08	385.99	Square cut on downstream right end of headwall of culvert under Greenway Road, approximately 0.20 mile east along Greenway Road from intersection with High Street.
RM 17	08	384.19	Chiseled square in upstream right headwall of concrete box culvert under Interstate Route 684 at Cox Avenue overpass.
RM 18	08	415.67	Square cut on upstream left corner of concrete wheel guard of Byram Lake Road overpass of Interstate Route 684.

EXHIBIT 3 - ELEVATION REFERENCE MARKS - continued

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 19	08	392.73	Square cut on upstream right headwall of concrete box culvert under Interstate Route 684, approximately 600 feet upstream of Byram Lake Road overpass, approximately 28 feet west of edge of Interstate Route 684.
RM 20	08	410.49	Square cut on southeast corner of concrete rim of drop inlet at intersection of Byram Lake Road and Byram Hill Road, approximately 25 feet west of Byram Lake Road centerline and approximately 35 feet north of Byram Hill Road centerline.



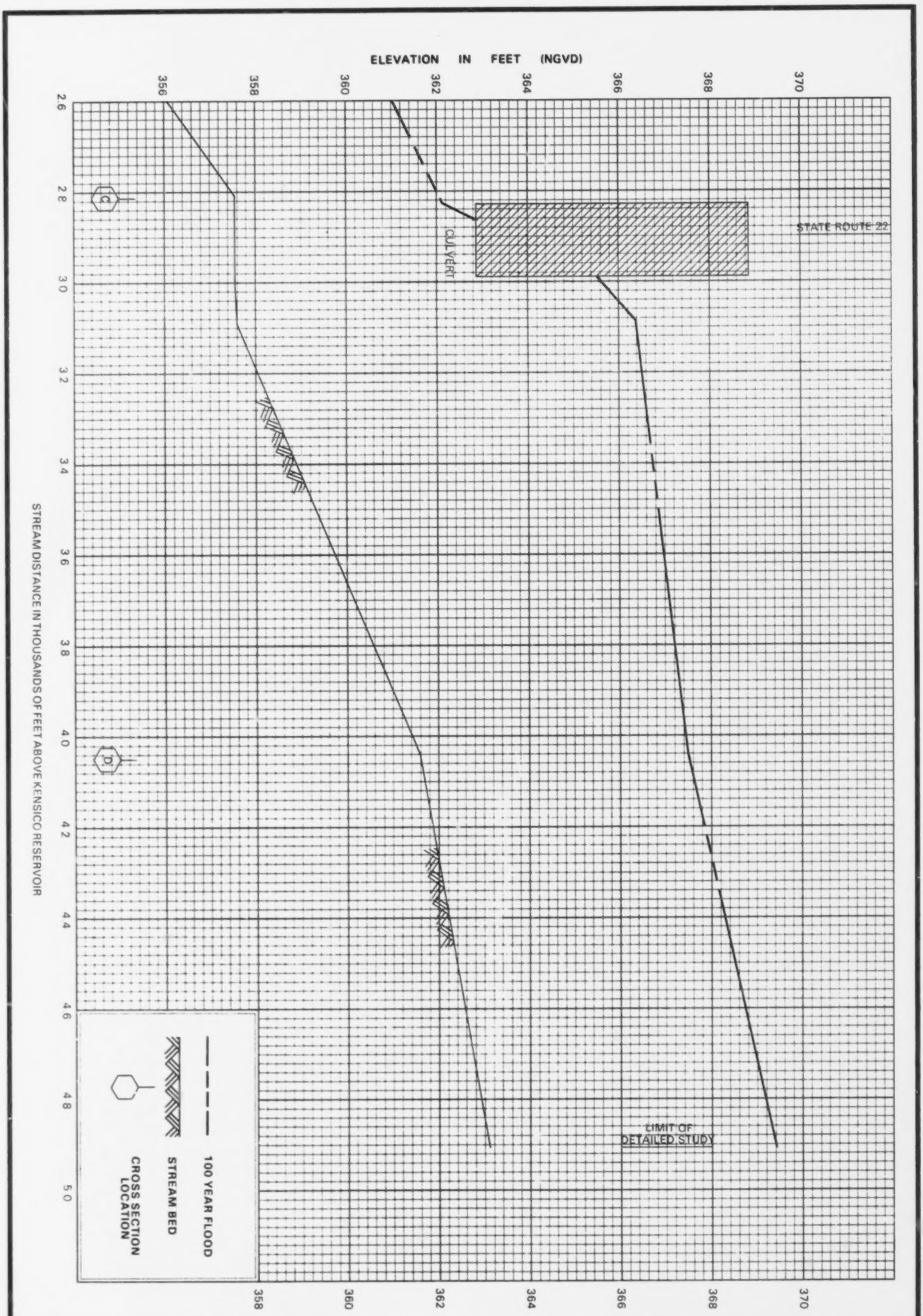
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

BEAR GUTTER CREEK

01P



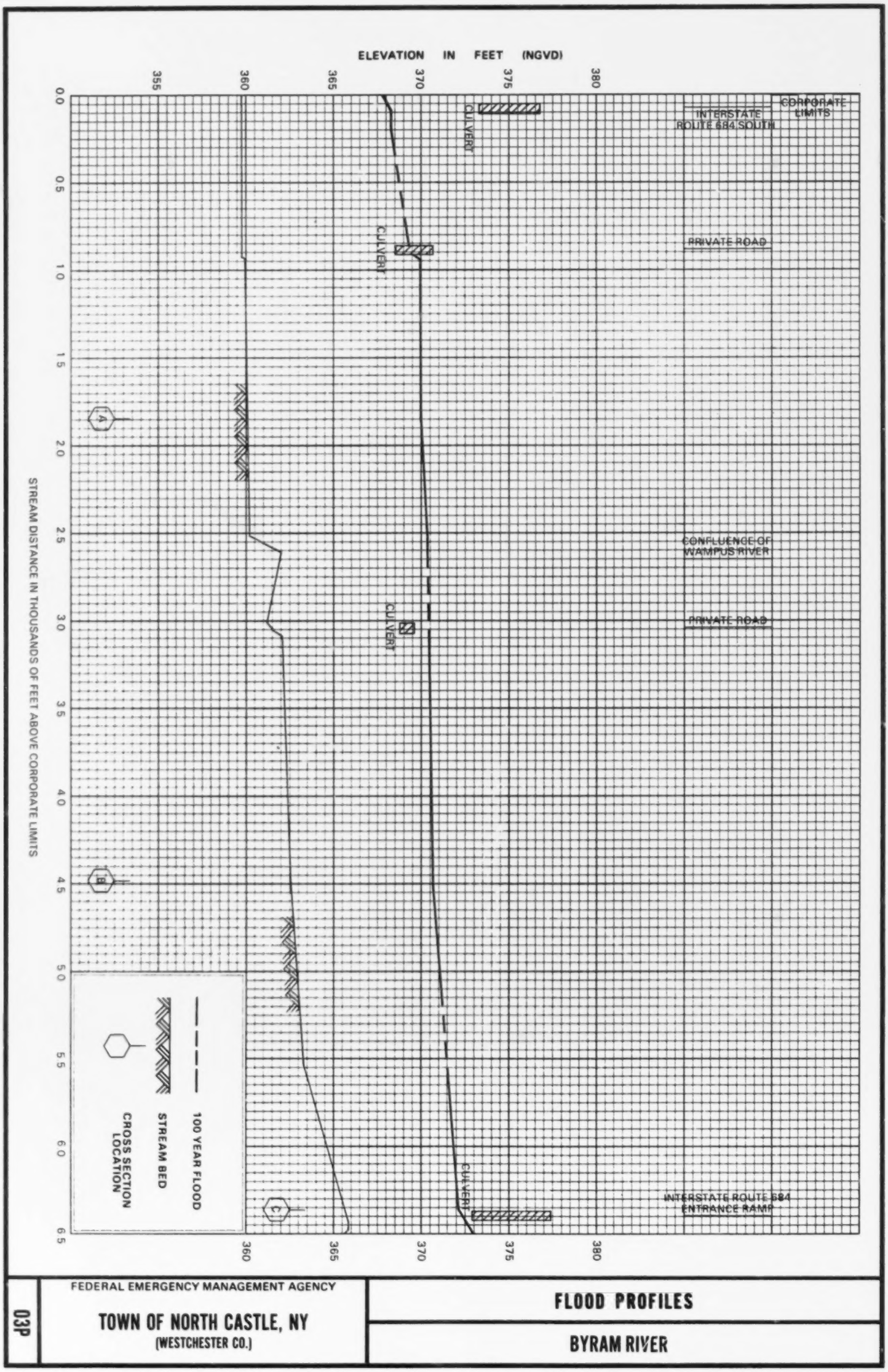
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

BEAR GUTTER CREEK

02P



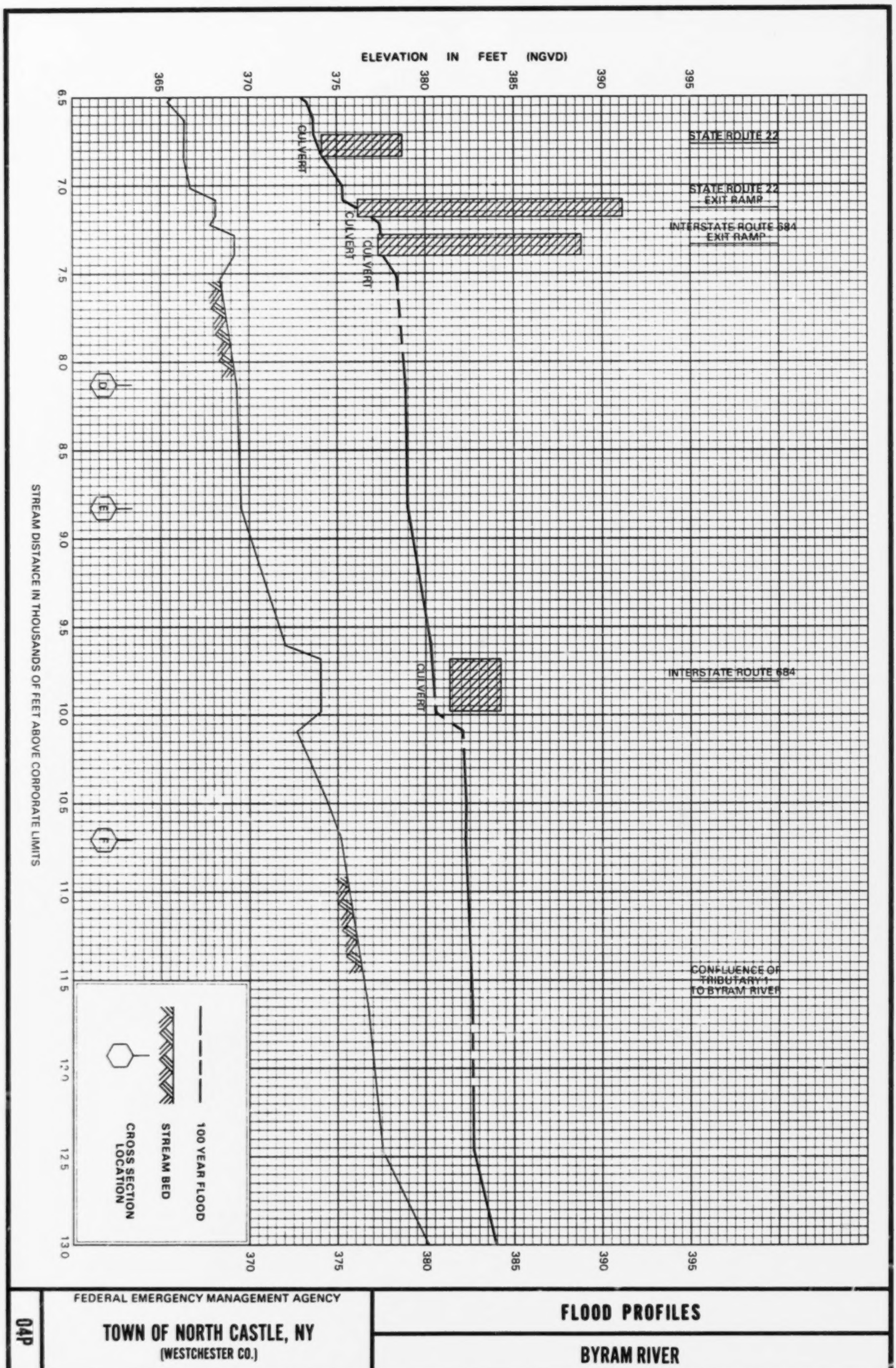
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

03P

FLOOD PROFILES

BYRAM RIVER



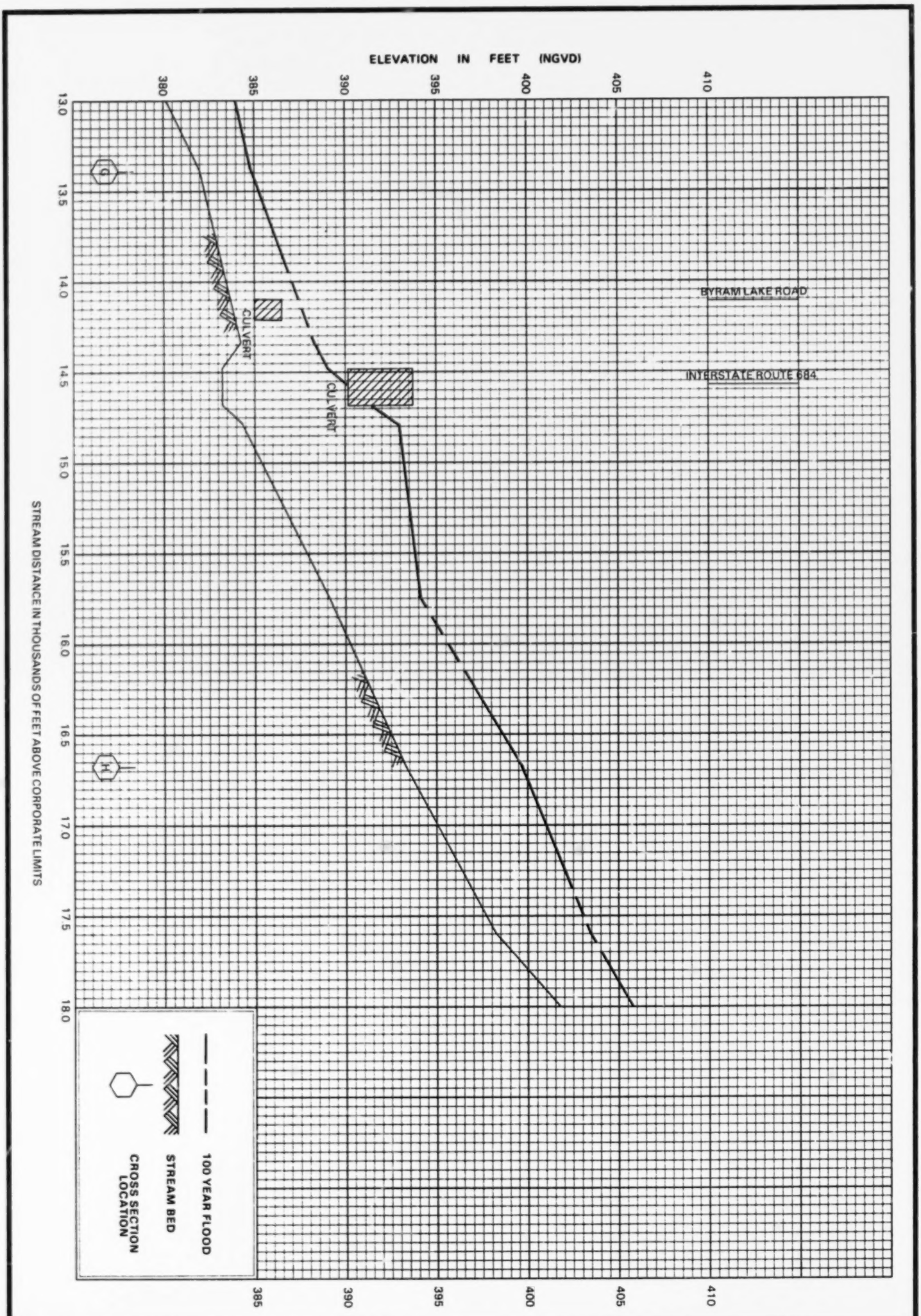
04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

BYRAM RIVER



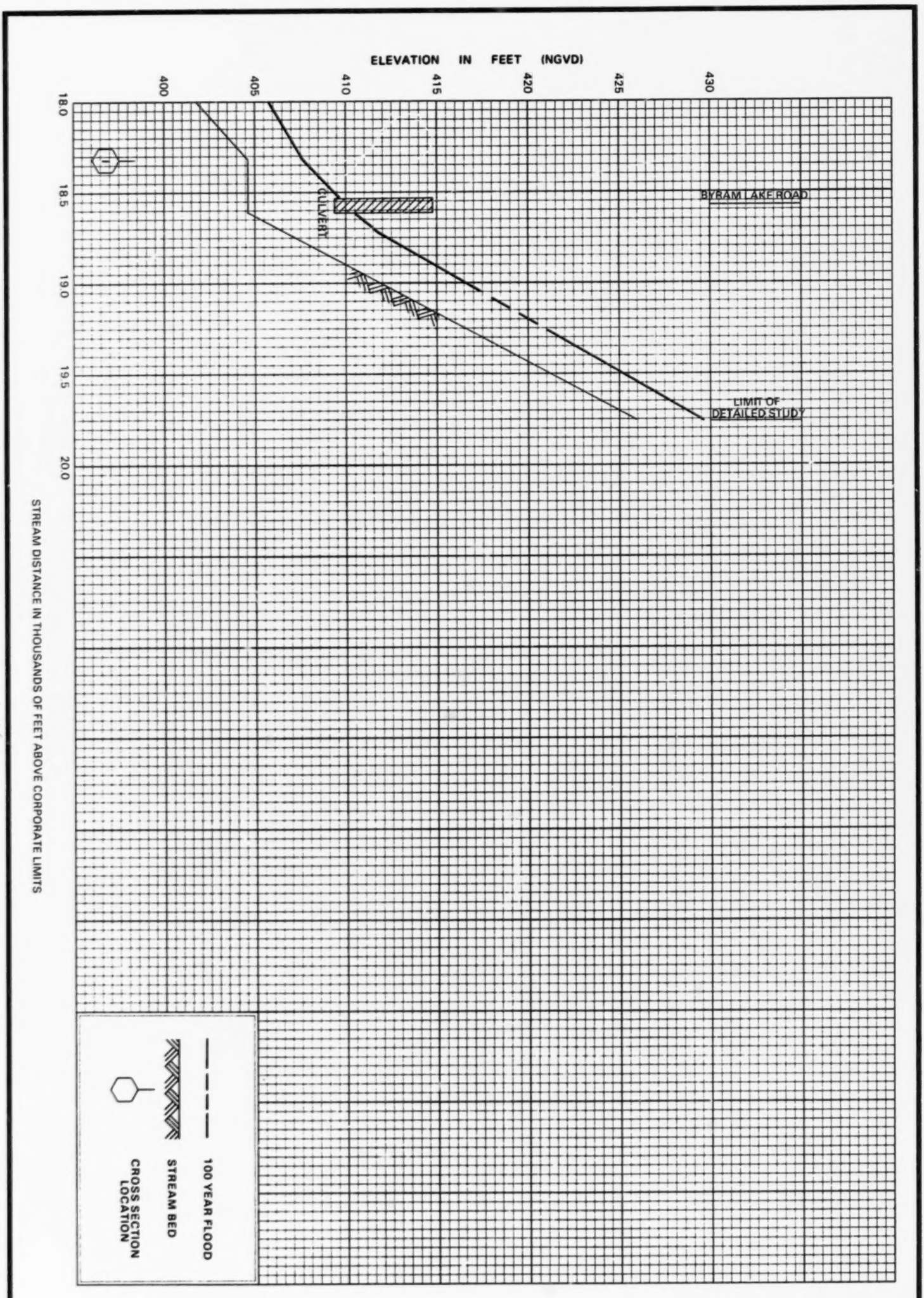
05P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

BYRAM RIVER



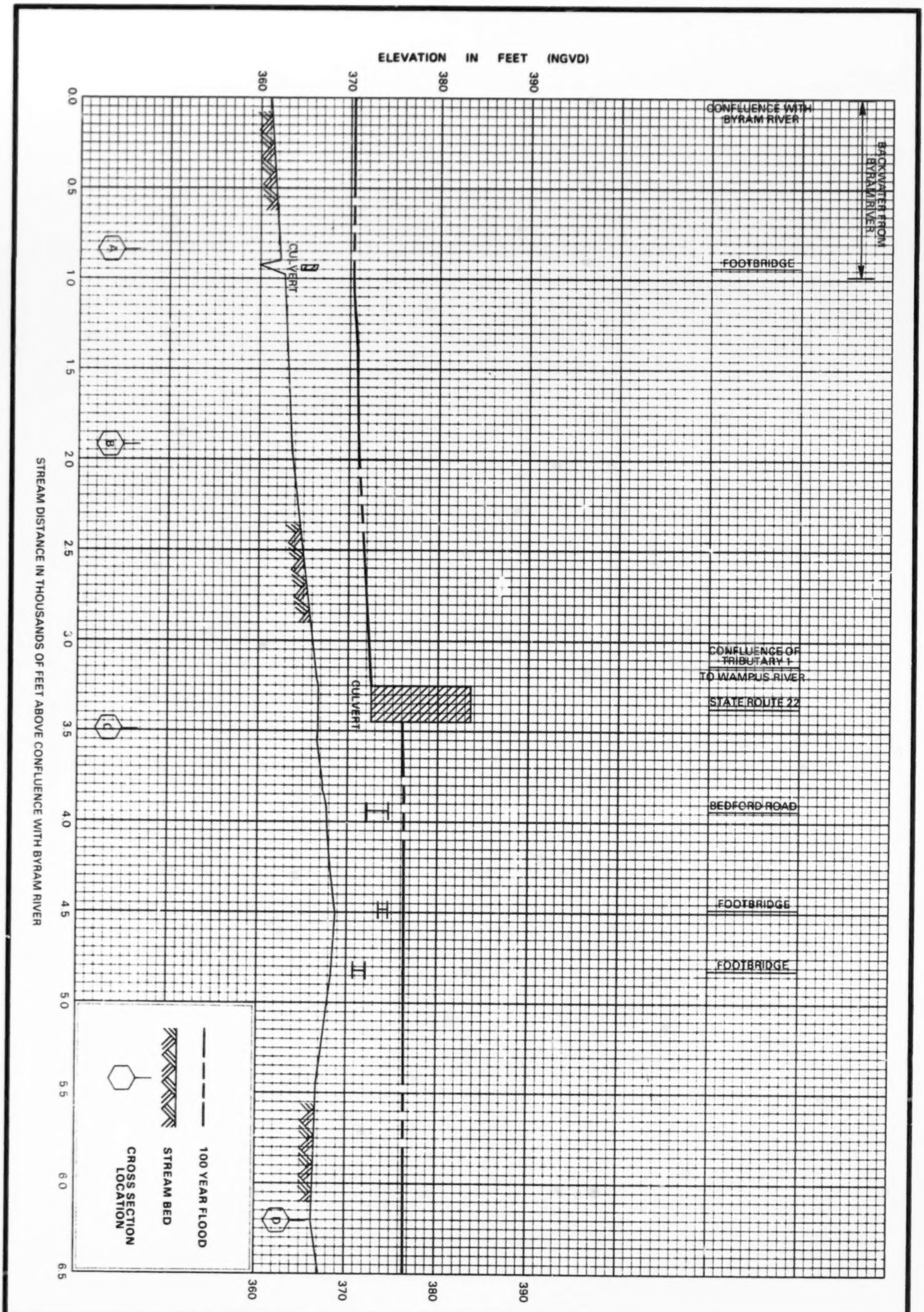
06P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

BYRAM RIVER



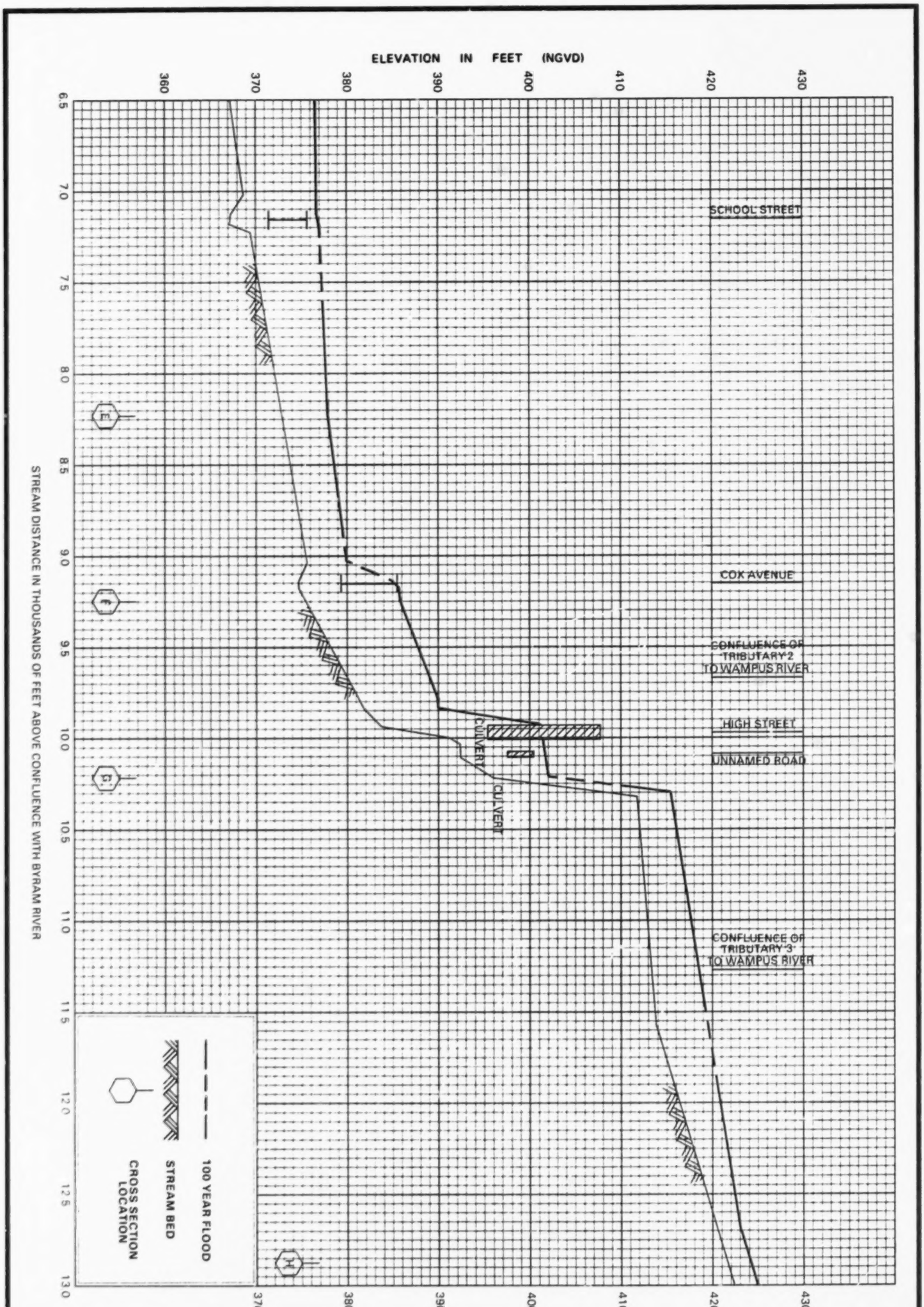
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

WAMPUS RIVER

07P



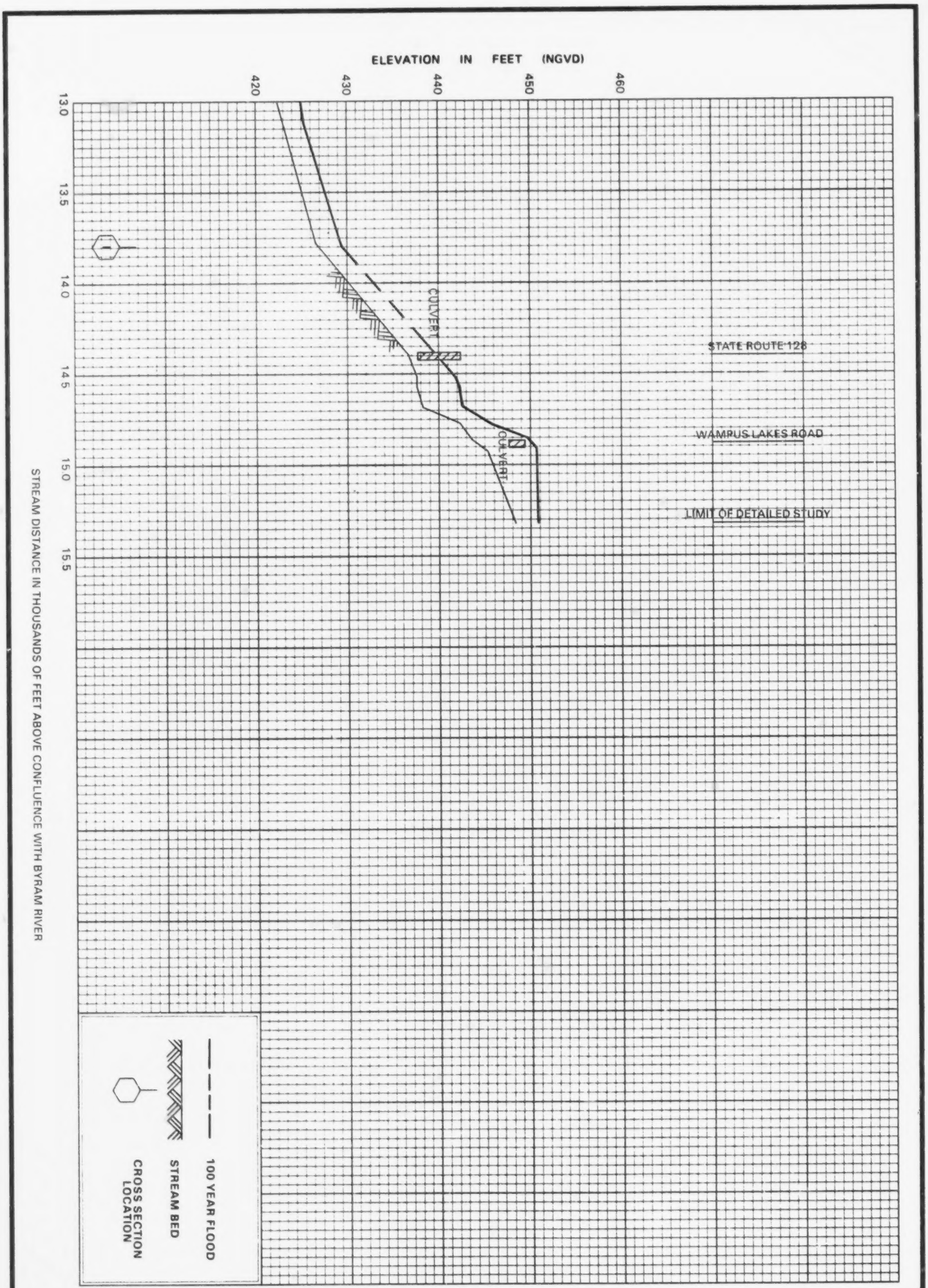
08P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

WAMPUS RIVER



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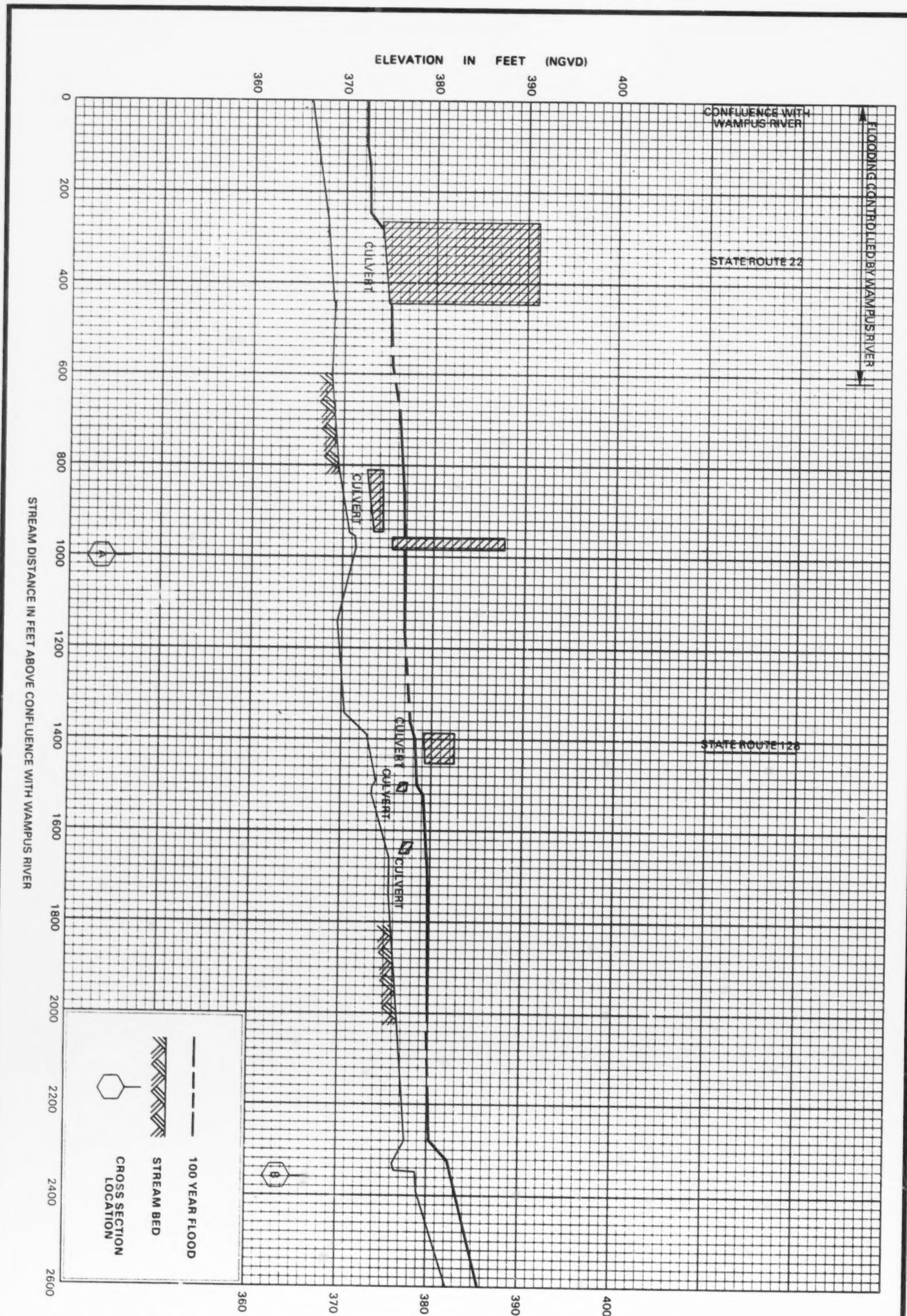

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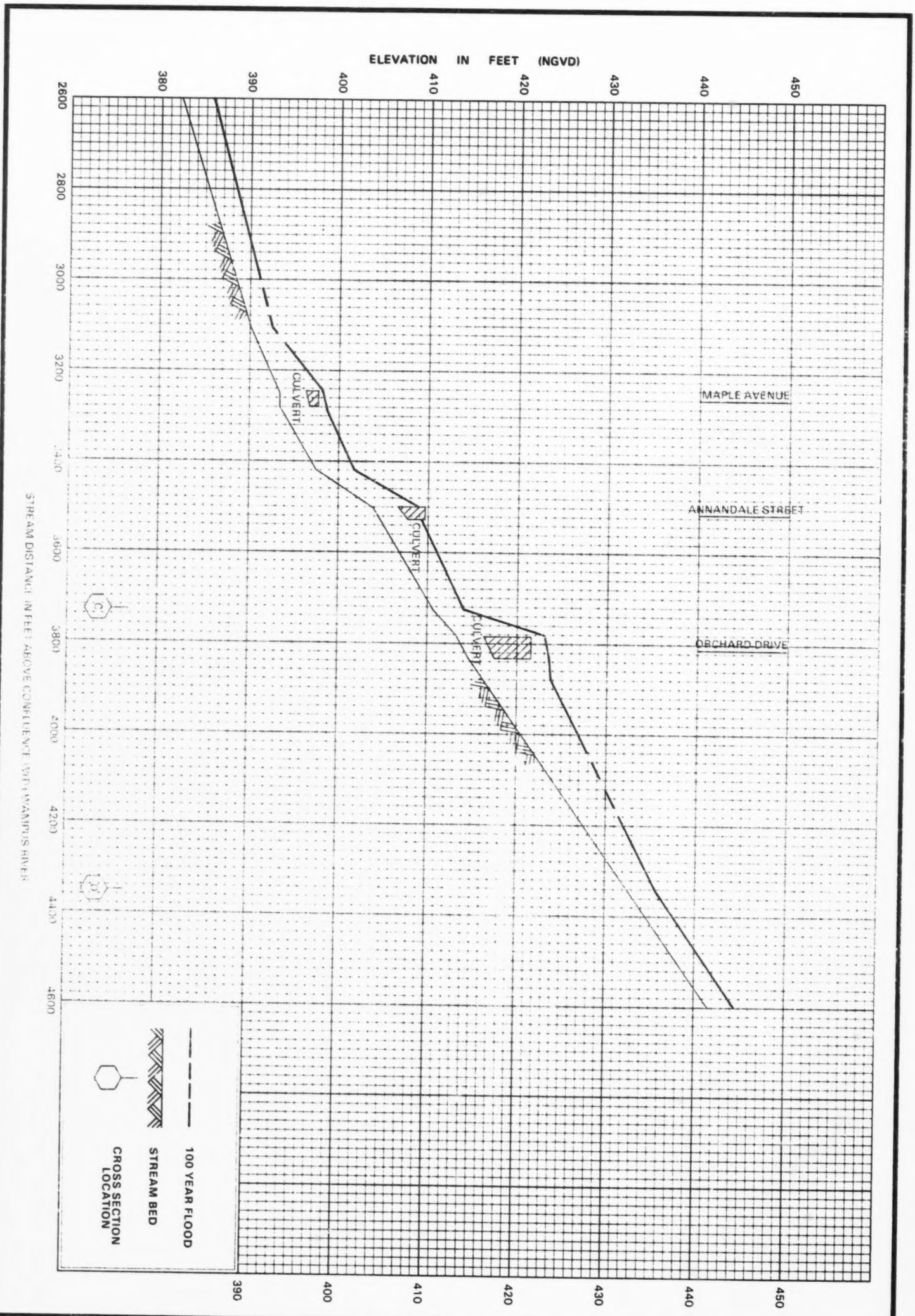


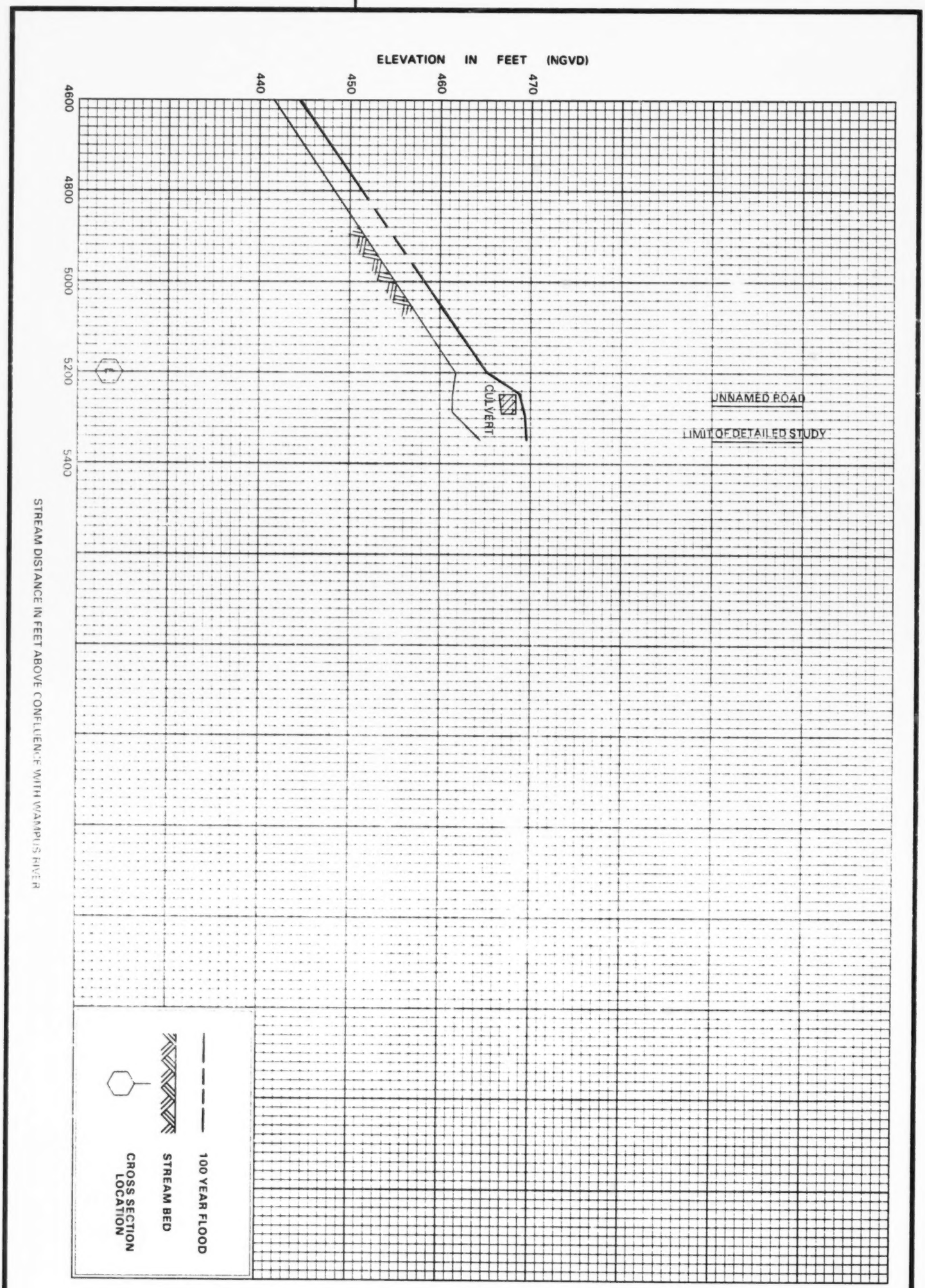
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

TRIBUTARY 1 TO WAMPUS RIVER

11P



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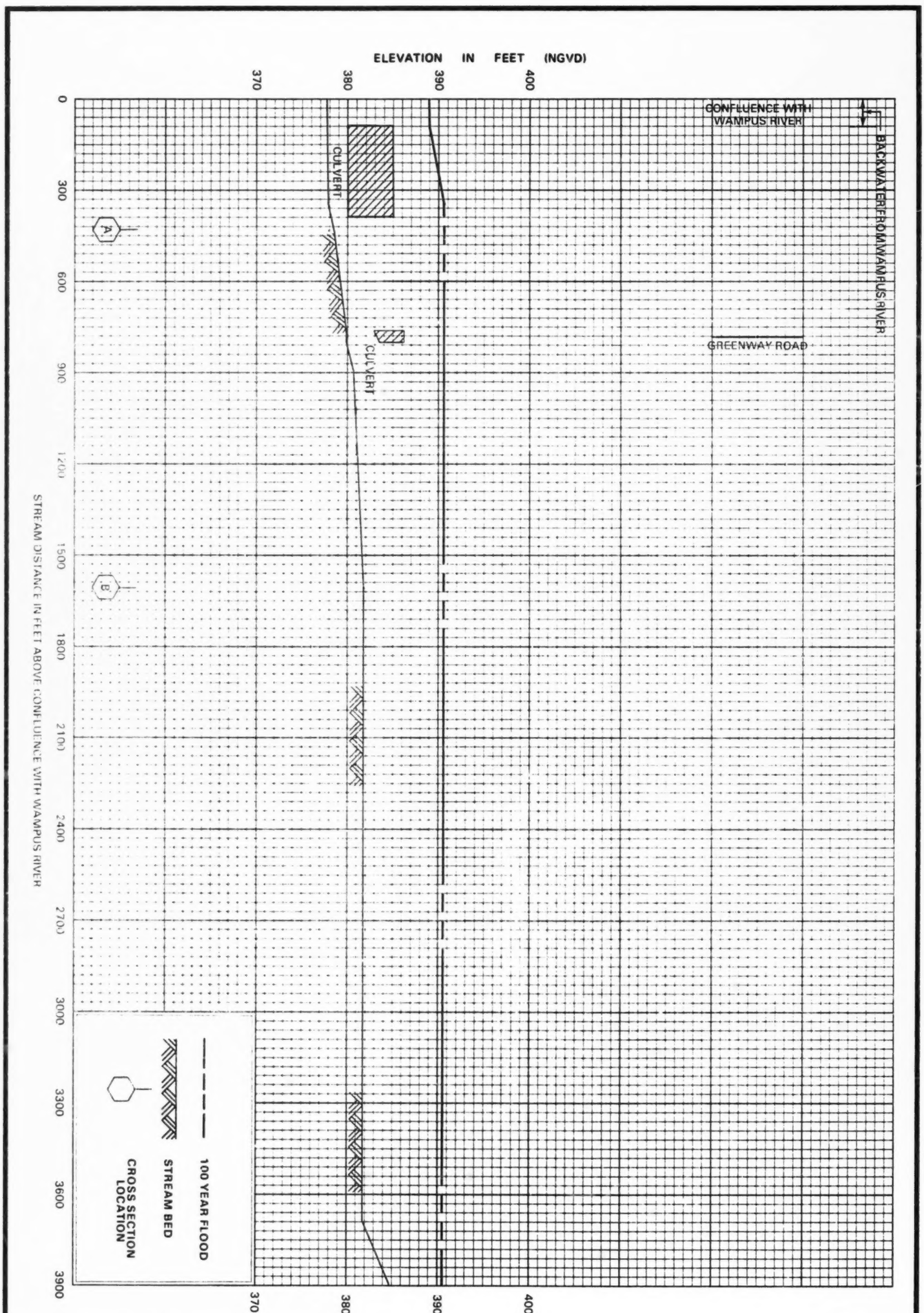


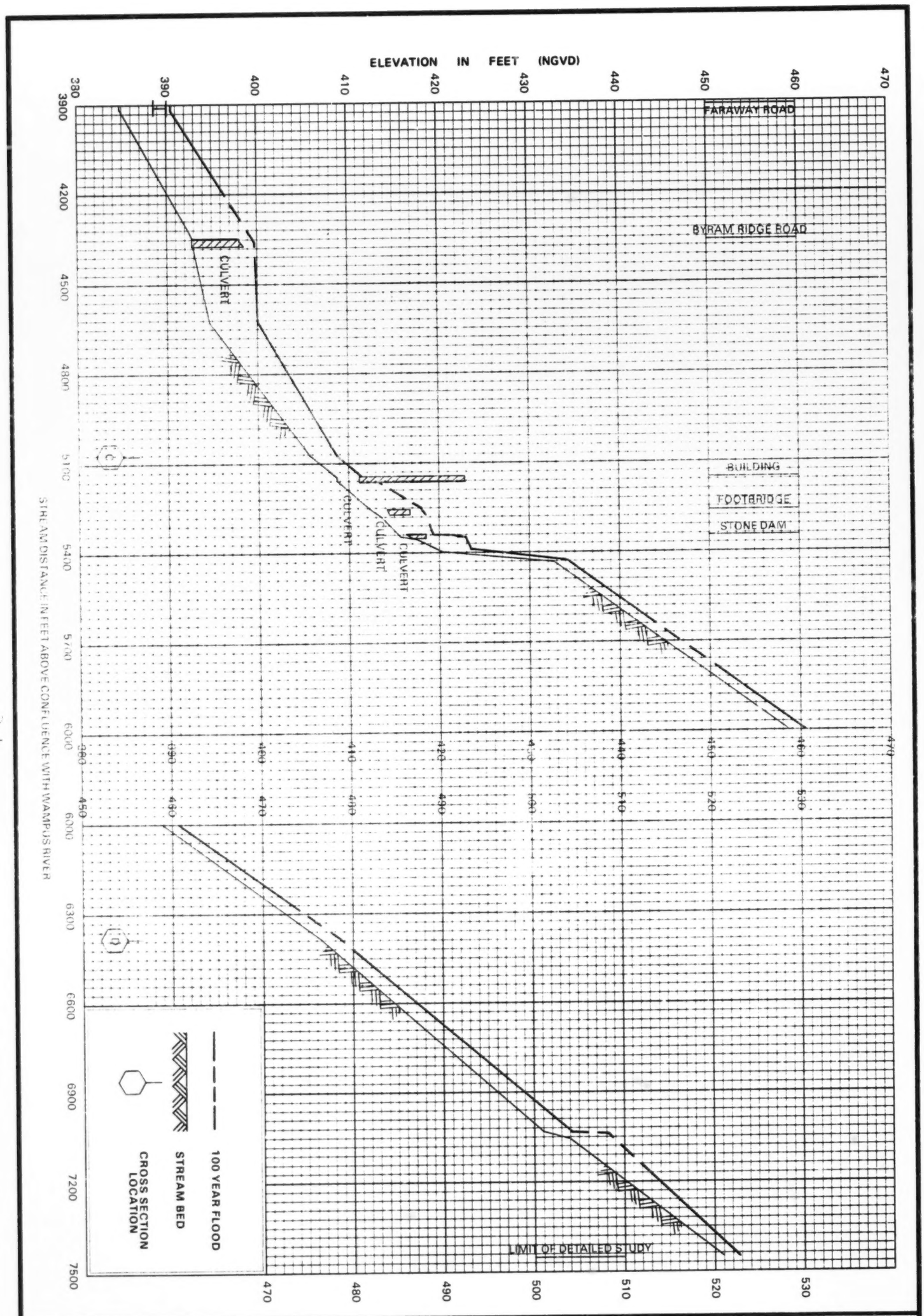
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

TRIBUTARY 2 TO WAMPUS RIVER

13P



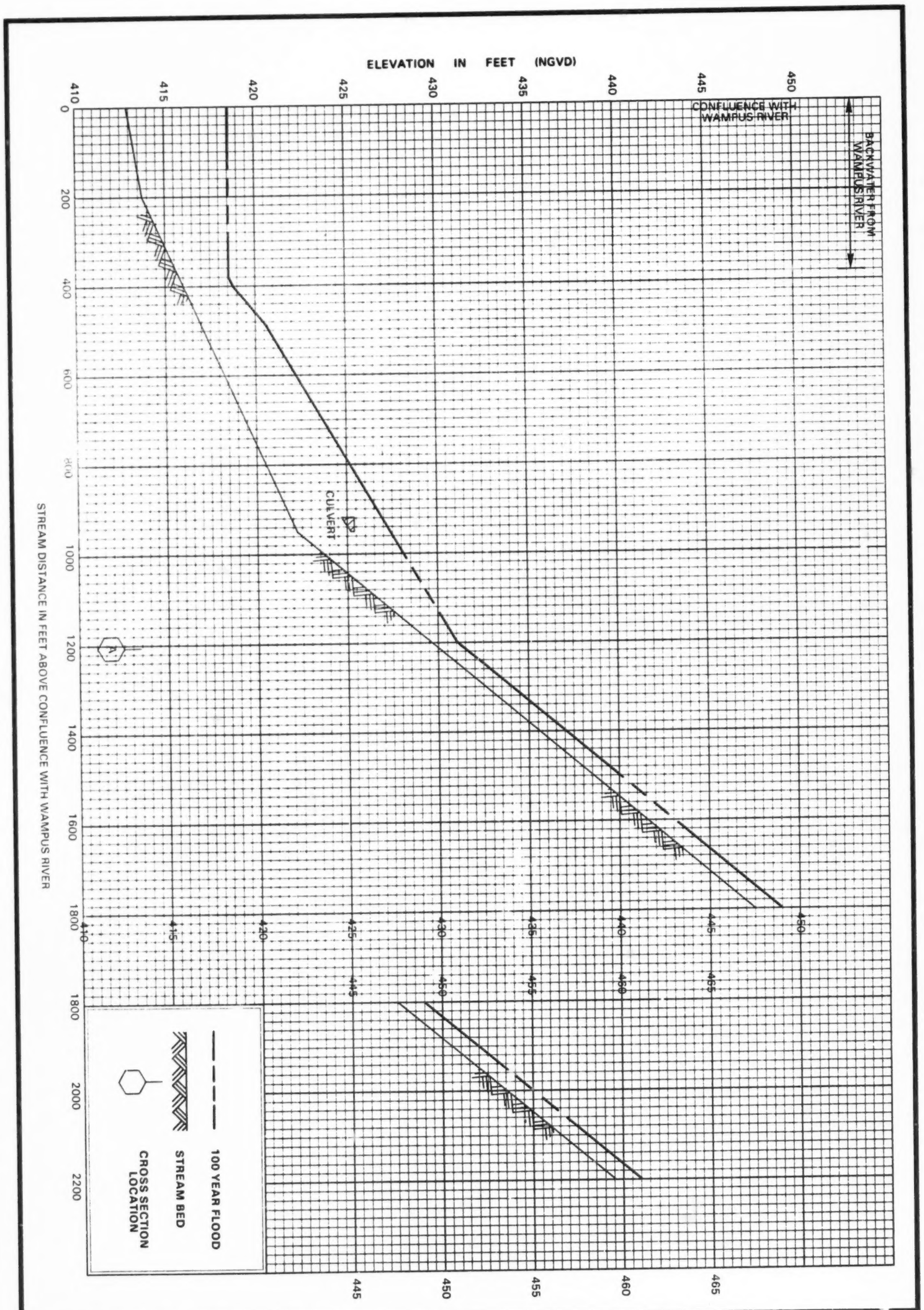
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

TRIBUTARY 2 TO WAMPUS RIVER

14P

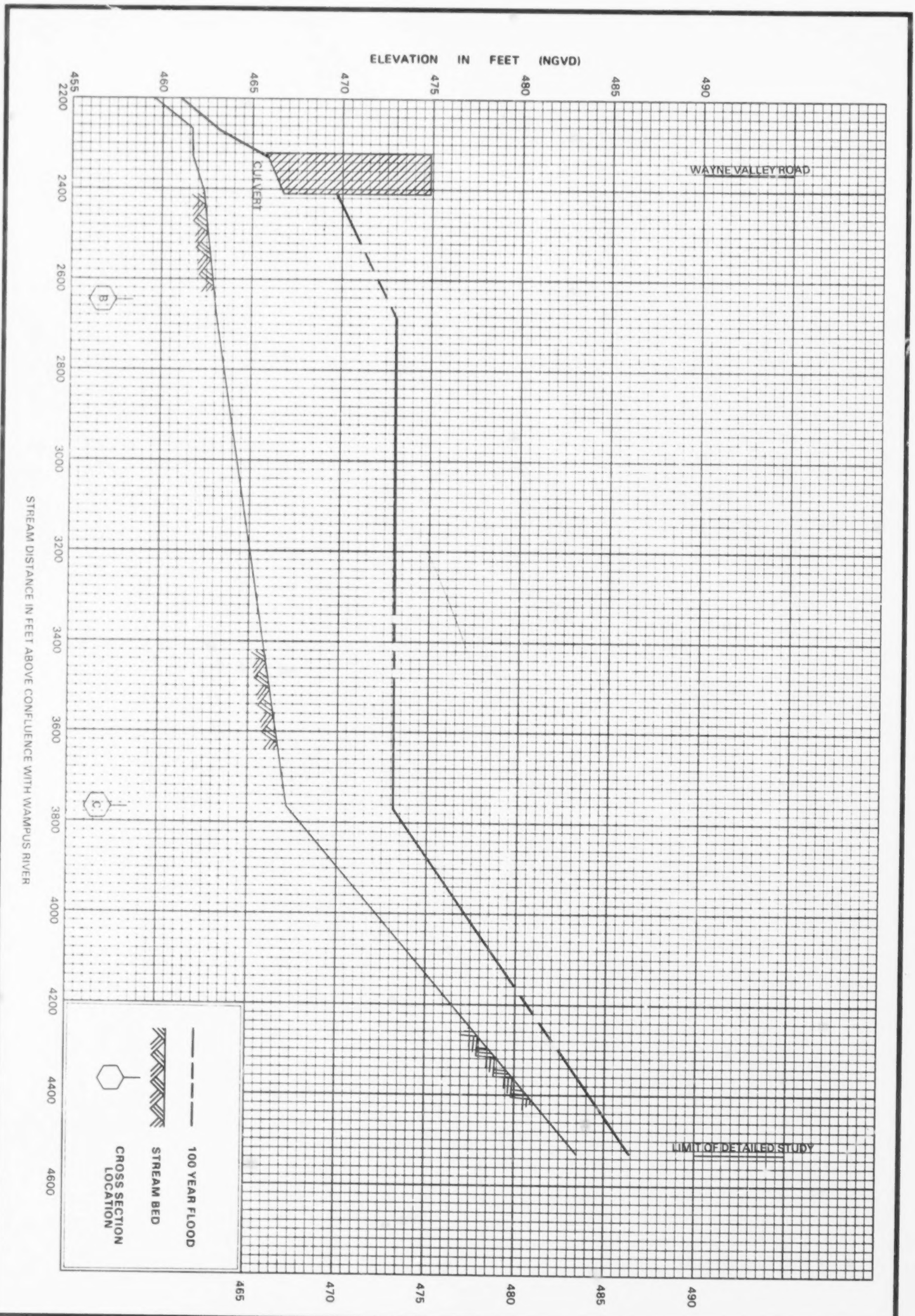


FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

TRIBUTARY 3 TO WAMPUS RIVER



FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF NORTH CASTLE, NY
(WESTCHESTER CO.)

FLOOD PROFILES

TRIBUTARY 3 TO WAMPUS RIVER

16P